

CLAIMS

1. A process for the preparation of a direct emulsion, characterized in that the dilution is carried out, in an aqueous phase, of a clear emulsifiable concentrate comprising an oil phase, optionally water, and amphiphilic compounds composed of at least one surfactant, at least one copolymer having at least one hydrophilic segment and at least one hydrophobic segment, with the exclusion of copolymers comprising only segments obtained from ethylene oxide and from propylene oxide, optionally at least one cosurfactant and optionally at least one neutralizing agent;
- the total content of amphiphilic compounds representing 1 to 40% by weight of the emulsifiable concentrate;
  - the content of copolymer representing 0.1 to 25% by weight of said amphiphilic compounds;
  - more than 75% by volume of the droplets of the emulsion having a mean size of less than or equal to 1  $\mu\text{m}$ ;
  - the mean size of the droplets of an emulsion obtained by dilution of said concentrate being less than that of an emulsion obtained by dilution of an emulsifiable concentrate devoid of said copolymer, the total concentration of amphiphilic compounds being the same in both cases.
2. The process as claimed in the preceding claim, characterized in that the hydrophobic segment of the copolymer is obtained from one or more of the following monomers:
- esters of linear, branched, cyclic or aromatic mono- or polycarboxylic acids comprising at least one ethylenic unsaturation,
  - $\alpha,\beta$ -ethylenically unsaturated nitriles, vinyl ethers, vinyl esters, vinylaromatic monomers,

vinyl halides or vinylidene halides,

- linear or branched aromatic or nonaromatic hydrocarbonaceous monomers comprising at least one ethylenic unsaturation,

5 - propylene oxide or butylene oxide, alone or as mixtures, and the macromonomers deriving from such monomers.

3. The process as claimed in either of the preceding  
10 claims, characterized in that the hydrophilic segment of the copolymer is obtained from one or more of the monomers comprising at least one carboxylic, sulfonic, sulfuric, phosphonic, phosphoric or sulfosuccinic functional group,  
15 their salts, and the corresponding macromonomers.

4. The process as claimed in the preceding claim, characterized in that the hydrophilic segment of the copolymer is obtained from one or more of the  
20 following monomers:

- linear, branched, cyclic or aromatic mono- or polycarboxylic acids, the N-substituted derivatives of such acids, or monoesters of polycarboxylic acids comprising at least one  
25 ethylenic unsaturation;

- linear, branched, cyclic or aromatic vinylcarboxylic acids;

- amino acids comprising one or more ethylenic unsaturations;

30 alone or as mixtures, their precursors, their sulfonic or phosphonic homologs or their salts, and the macromonomers deriving from such monomers or from their salts.

5. The process as claimed in one of the preceding  
35 claims, characterized in that the hydrophilic segment of the copolymer is obtained from one or more of the following monomers:

- aminoalkyl (meth)acrylates or aminoalkyl(meth)-

acrylamides;

- monomers comprising at least one secondary, tertiary or quaternary amine functional group or a heterocyclic group comprising a nitrogen atom, vinylamine or ethyleneimine;
  - diallyldialkylammonium salts;
- alone or as mixtures, or the corresponding salts, and the macromonomers deriving from such monomers.

6. The process as claimed in one of the preceding claims, characterized in that the hydrophilic segment of the copolymer is obtained from one or more of the following monomers: ethylene oxide; the amides of linear, branched, cyclic or aromatic mono- or polycarboxylic acids comprising at least one ethylenic unsaturation, or derivatives; hydrophilic esters deriving from (meth)acrylic acid; vinyl esters which make it possible to obtain poly(vinyl alcohol) blocks after hydrolysis; vinylpyrrolidone; monomers of the type of the sugars, and the macromonomers deriving from such monomers.

7. The process as claimed in one of the preceding claims, characterized in that the hydrophobic segment can comprise one or more hydrophilic units.

8. The process as claimed in one of the preceding claims, characterized in that the hydrophilic segment can comprise one more hydrophobic units.

9. The process as claimed in one of the preceding claims, characterized in that the copolymer exhibits a weight-average molar mass of at most 50 000 g/mol, preferably at most 20 000 g/mol.

10. The process as claimed in one of the preceding claims, characterized in that the copolymer

exhibits a weight-average molar mass of at least 2500 g/mol, preferably of at least 5000 g/mol.

- 5 11. The process as claimed in one of the preceding claims, characterized in that the copolymer exhibits a block structure, more particularly a diblock or triblock structure.
- 10 12. The process as claimed in one of the preceding claims, characterized in that the copolymer exhibits a comb structure.
- 15 13. The process as claimed in one of the preceding claims, characterized in that the surfactant or surfactants are chosen from nonionic or anionic surfactants which are soluble in the oil.
- 20 14. The process as claimed in one of the preceding claims, characterized in that the surfactant or surfactants are chosen from the following nonionic surfactants:
  - alkoxylated fatty alcohols, more particularly comprising from 6 to 22 carbon atoms;
  - alkoxylated mono-, di- and triglycerides;
  - 25 - alkoxylated fatty acids, more particularly comprising from 6 to 22 carbon atoms;
  - alkoxylated sorbitan esters (cyclized esters of sorbitol and of fatty acid comprising from 10 to 20 carbon atoms);
  - 30 - alkoxylated fatty amines, more particularly comprising from 6 to 22 carbon atoms;
  - alkoxylated alkylphenols, more particularly comprising one or two linear or branched alkyl groups having 4 to 12 carbon atoms;
  - 35 - alkylpolyglucosides;
  - polyoxyalkylenated surfactants, such as, for example, the compounds sold under the Pluronic or Poloxamer range by BASF;
  - alkoxylated mono- and dialkanolamides;

alone or as mixtures.

15. The process as claimed in one of the preceding claims, characterized in that the surfactant or  
5 surfactants are chosen from the following anionic surfactants, in acid form or combined with a polyvalent counterion:
- alkyl ester sulfonates or alkyl ester sulfates;
  - alkylbenzenesulfonates, primary or secondary  
10 alkylsulfonates or alkylglycerolsulfonates;
  - alkyl sulfates;
  - alkyl ether sulfates;
  - alkylamide sulfates;
  - salts of saturated or unsaturated fatty acids,  
15 N-acyl-N-alkyltaurates, alkyl isethionates, alkylsuccinamates and alkyl sulfosuccinates, monoesters or diesters of sulfosuccinates, N-acylsarcosinates or polyethoxycarboxylates; and
  - alkyl and/or alkyl ether and/or alkylaryl ether  
20 phosphate esters;
- alone or as mixtures.
16. The process as claimed in one of the preceding  
25 claims, characterized in that the proportion by weight of copolymer with respect to the surfactant is between 0.5 and 10% by weight.
17. The process as claimed in one of the preceding  
30 claims, characterized in that the cosurfactant is chosen from primary alcohols comprising at least one saturated or unsaturated and linear or branched aliphatic radical comprising from 4 to 22 carbon atoms or at least one aromatic radical,  
35 preferably comprising 6 carbon atoms, optionally carrying one or more alkyl substituents comprising 1 to 10 carbon atoms.

18. The process as claimed in one of the preceding claims, characterized in that the cosurfactant/surfactant proportion by weight is between 0 (not included) and 50% by weight, preferably between 5 and 40% by weight.
19. The process as claimed in one of the preceding claims, characterized in that the neutralizing agent is chosen from compounds which are soluble in the oil phase and which carry at least one amine or carboxylic functional group.
20. The process as claimed in one of the preceding claims, characterized in that the neutralizing agent/surfactant proportion by weight is between 0 (not included) and 50% by weight, preferably between 5 and 40% by weight.
21. The process as claimed in one of the preceding claims, characterized in that the total content of amphiphilic product is between 5 and 30% by weight of the emulsifiable concentrate.
22. The process as claimed in one of the preceding claims, characterized in that the amount of water is such that the emulsifiable concentrate is clear, preferably less than or equal to 10% by weight.
23. The process as claimed in one of the preceding claims, characterized in that the content of emulsifiable concentrate represents 0.1 to 40% by weight of the aqueous phase, preferably 0.1 to 30% by weight of the aqueous phase.
24. A clear emulsifiable concentrate comprising an oil phase, optionally water, and amphiphilic compounds composed of at least one surfactant, at least one copolymer having at least one hydrophilic segment

- and at least one hydrophobic segment, with the exclusion of copolymers comprising only segments obtained from ethylene oxide and from propylene oxide, optionally at least one cosurfactant and
- 5 optionally at least one neutralizing agent;
- \* the total content of amphiphilic compounds representing 1 to 40% by weight of the emulsifiable concentrate;
- \* the content of copolymer representing 0.1 to
- 10 25% by weight of said amphiphilic compounds.